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USATHAMA

U.S. Army Toxic and Hazardous Materials Agency

Report of Sampling and Analysis Results

Woodbridge Army Housing Units Woodbridge, Virginia

August 1990

Prepared for:

U.S. ARMY TOXIC AND HAZARDOUS MATERIALS AGENCY
Aberdeen Proving Ground
Maryland 21010-5401

Prepared by:

WESTON

Under the supervision of:

Environmental Assessment and Information Sciences Division
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Argonne, Illinois 60439

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Roy F. Weston, Inc. has conducted a sampling and analysis program of the Army housing property located in Woodbridge, Virginia. The objectives of this effort include further characterization of environmental contamination identified in an enhanced preliminary assessment carried out in 1989. The specific activities performed at this site were identification, evaluation of the condition, and collection of samples from specific suspected asbestos-containing materials, including floor tiles, pipe run and pipe fitting insulation, dust in the ductwork, and exterior siding, where present. These evaluations were necessary to clarify potential environmental issues identified in the earlier report, prior to the sale or realignment of the property.

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SAMPLING AND ANALYSIS AT THE U.S. ARMY FAMILY HOUSING UNIT (FHU) PROPERTY WOODBRIDGE, VIRGINIA

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EXECUTIVE SUMMARY

The U.S. Army family housing units (FHUs) at Woodbridge, Virginia were inspected by Roy F. Weston, Inc. (WESTON) personnel during February 1990 to further evaluate the environmental concerns identified in the enhanced Preliminary Assessment reports prepared and submitted earlier by Argonne National Laboratory (ANL) for the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). Three of the nine single-family housing units were examined on 26 February to investigate the possible presence of asbestos-containing materials (ACM). An assessment of airborne asbestos exposure was performed at one unit on this property on 27 April 1990 by a WESTON Certified Industrial Hygienist (CIH), because asbestos fibers were detected in the dust deposited within the ductwork of the heating system.

The ANL Draft Sampling and Analysis Plan, Revision 1 (SAP) specified sampling the following materials, where present, which are suspected to contain asbestos, from ten per cent of the housing units or a minimum of three housing units, whichever is greater.

- Pipe run insulation.
- Dust accumulated inside heating ductwork within the concrete slab, where present and open.
- Vinyl floor tiles.

The WESTON personnel selected three housing units for inspection after review of maintenance records and drawings, discussions with housing management personnel, and determination that the units were in similar condition. The housing units chosen, Nos. 14002, 14006, and 14011, were considered to be representative of the other six units, but this was not confirmed by an examination of all the units.

Twelve dust samples and nine samples of floor tile were collected by WESTON and analyzed. These analyses revealed that asbestos is present in dust accumulated within the heating ductwork and in floor tile at the three housing units examined. Asbestos was found in six of the 12 dust samples by transmission electron microscopy (TEM), and in at least two samples from each unit. Asbestos was quantified at 1% or greater by polarized light microscopy (PLM) in seven of the floor tile samples, and was qualitatively identified in two other samples by TEM. No pipe insulation samples were collected since the pipes in the units examined were not insulated. During the asbestos sampling activity, other suspect materials observed were roofing materials, expansion joints on the heating units, and cementitious board in the furnace room.

The following practices should be observed with regard to the known and suspected asbestos-containing materials identified:

- The risks posed by the asbestos-containing dust in the ductwork cannot be clearly evaluated, because the sampling and analysis program only included a qualitative screening of this material since no approved quantitative procedure exists. Further studies, such as air sampling, were recommended to determine if the asbestos is becoming airborne and to define what risks, if any, are presented by these findings. These studies were subsequently performed and the findings are presented in this report.

- The vinyl floor tiles pose no significant risk as long as they are in good condition and are not damaged by excessive wear or misuse. They should be managed in place under an Operations and Maintenance (O&M) program which describes procedures for the regular inspection of the floor coverings and the removal and replacement of any that become damaged.

Samples for airborne asbestos were collected from four wall or ceiling vents, one located in each of the living room, entry hallway, bedroom, and bathroom, in an unoccupied two-story townhouse-type unit which had been inspected previously. The air samples were subjected to analysis by TEM to identify and quantify any asbestos fibers collected. One chrysotile asbestos cluster was found in the sample from the hallway vent. The sample volume collected resulted in air airborne asbestos fiber concentration of 0.005 fibers per cubic centimeter (f/cc). While airborne asbestos fibers are present at this FHU property, the worst-case concentration averages <0.005 f/cc and does not pose a substantial risk to occupants.

SECTION 1. INTRODUCTION

SAMPLING AND ANALYSIS AT THE U.S. ARMY FAMILY HOUSING UNIT (FHU) PROPERTY WOODBRIDGE, VIRGINIA

SECTION 1. INTRODUCTION

Roy F. Weston, Inc. (WESTON) was retained by Argonne National Laboratory (ANL) to provide assistance in gathering additional environmental data for the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) at 53 family housing unit (FHU) properties in 12 states. The Woodbridge, Virginia property is one of these FHUs.

1.1 PURPOSE AND SCOPE

The purpose of this project was to provide the Department of the Army with sound environmental data on the properties which are scheduled for sale or realignment as a result of the Defense Authorization Amendments and Base Closure and Realignment Act (Public Law 100-526). Environmental assessments of each property covered by the Act are required by the Secretary of Defense prior to their closure or realignment. Such actions must be performed in accordance with applicable provisions of the National Environmental Policy Act (NEPA) to ensure that any environmental hazards will be identified and mitigated where required.

Previously, ANL conducted enhanced preliminary assessments (PAs) for each property. These enhanced PAs made recommendations regarding sampling and analysis to determine (1) whether and in what quantities asbestos is present in certain building construction materials (including pipe run insulation, dust accumulated in heating ductwork, vinyl floor tile, and exterior siding shingles, where present), (2) in selected contexts, whether and in what concentration soils and groundwater may be contaminated, and (3) whether and in what range transformer oils at selected sites may contain polychlorinated biphenyls (PCBs). WESTON gathered this data by implementing ANL's Draft FHU Sampling and Analysis Plan, Revision 1 (SAP). Subsequent to the initial studies, WESTON, ANL, and USATHAMA decided that a follow-up effort was required to determine if asbestos fibers were becoming airborne from the dust in the heating system. This study was implemented, and samples were collected to evaluate any risks to occupants from this source.

1.2 SITE DESCRIPTION

The Woodbridge housing area is a seven-acre site located in the far northeastern tip of Virginia, about 0.2 mile southeast of the city of Woodbridge in Prince William County. Terrain in the general area is grassy rolling plain, with a scattering of trees. A single-paved street, Dawson Beach Road, runs through the center of the area, with the housing units on either side facing the street.

The area consists of nine housing units, a storage building, a playground, and a bus stop waiting shelter. One building is a duplex with two units, one with two bedrooms and one with three bedrooms. The other apartment building has seven units; four of these have two bedrooms each, and three have three bedrooms each. Each unit is equipped with air conditioning and heated with forced-air furnaces fired with oil. The exterior units are finished with brick veneer.

1.3 REPORT ORGANIZATION

This report contains the results of the sampling and analysis program performed by WESTON. Section 2 contains a description of the asbestos sampling performed at the property and laboratory results for samples of suspected asbestos-containing material (ACM) collected. Copies of field notes and laboratory results pertaining to asbestos are provided in Appendices A.1 and A.2. Section 3 presents a description of the field sampling activities and results of the analyses for airborne asbestos fibers. Field notes and copies of the laboratory reports for this effort are presented in Appendices B.1 and B.2, respectively. Section 4 is a summation of all activities and findings for the Woodbridge site.

SECTION 2. ASBESTOS-CONTAINING MATERIALS

SECTION 2. ASBESTOS-CONTAINING MATERIALS

WESTON personnel inspected three of the nine units at the Woodbridge family housing facility on 26 February 1990 for the presence of suspected ACM. Vinyl floor tile and dust accumulated within the heating ductwork were the only suspect materials found within the buildings that were sampled. All sampling was done following the requirements of ANL's SAP. Additionally, all field work was performed in accordance with applicable Federal regulations, including 40 CFR Part 61 Subpart M, 40 CFR Part 763 Subpart E, and 29 CFR Part 1910.1001.

2.1 SAMPLING RATIONALE

The sampling rationale used by WESTON for this project followed the recommendations set forth by ANL. The type of suspect ACM to be sampled, the number of housing units to be examined at each FHU facility, and number of samples to be taken for each material found were described in the SAP. The plan for Woodbridge required sampling of the following materials, if present:

- Pipe run insulation.
- Accumulated dust inside heating ductwork if not sealed.
- Vinyl floor tiles.

In accordance with the SAP, three units were examined at this facility. The sampling plan, however, did not identify specific units which were to be sampled. The task of determining which housing units were representative of the facility as a whole and, therefore, would be sampled was left to the WESTON field team. After reviewing all available maintenance records and drawings and discussing the facility with Directorate of Engineering and Housing (DEH) personnel, it was determined that all of the units at the Woodbridge FHU were similar in condition. Units 14002, 14006, and 14011 were chosen by the WESTON field team leader as representative units to be sampled.

The SAP specifies that a minimum of two pipe run insulation samples, four dust samples, and one sample of each color of floor tile be collected from each of the housing units examined. Twelve dust samples and nine samples of vinyl floor tiles were collected at the facility. No pipe insulation samples were collected since the pipes in the units examined were not insulated.

2.2 FIELD ACTIVITIES AND OBSERVATIONS

Each of the units was inspected to determine if suspect materials were present. Heating ductwork vents in the units were not sealed, so dust samples were collected by wiping the inner surface of the duct near the designated exhaust vents with a fiber-free wipe selected for its ability to trap dust in a non-fibrous matrix. Each wipe was placed in the jaws of a flexible small parts pick-up tool and moistened with fiber free water. The grille was then removed and the tool inserted into the duct opening. The interior surface was wiped to collect dust on the moistened surface of the wipe. After the dust was gathered, the wipe was placed in a small plastic wide-mouth jar, sealed, labeled with the sample number, and shipped to the lab. The grille was then replaced and the tool was cleaned by rinsing and wet wiping the surfaces prior to collecting the next sample. Samples were collected from the living room, kitchen, bedroom, and main bathroom in all three units.

Four colors, brown, gray, black, and green, of 9" x 9" floor tile and white and yellow 12" x 12" floor tile were sampled. All three units contained white 12" x 12" floor tile. Unit 011 contained the green, black, and gray 9" x 9" floor tile. Units 002 and 006 contained brown 9" x 9" floor tile. Unit 002 contained yellow 12" x 12" floor tile. One sample of each of the floor tile types was taken in each housing unit, resulting in a total of nine samples for laboratory determination of asbestos content. These samples were taken by breaking off a small piece of floor tile in an inconspicuous location. About one square inch of the tile surface area was taken for each sample. No effort was made to separate the mastic, which sometimes contains asbestos, from the floor tile samples themselves.

The vinyl floor tile in all three of the units inspected was in good condition. This material is considered to be a non-friable type of ACM, unless damaged. If significant damage occurs, such that the material becomes friable as defined in the asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP), the U. S. Environmental Protection Agency (EPA) would classify these tiles as friable materials. However, an EPA interpretation was recently released that changes certain previous interpretations regarding non-friable ACM. On 23 February 1990, a memorandum was issued by the Director of Emissions Standards Division, the Director of Stationary Source Compliance Division, and the Associate Enforcement Counsel for Air Enforcement of the EPA Office of Air Quality Planning and Standards (OAQPS). This memorandum was circulated to other air quality officials and EPA regional offices in early March 1990. This latest position states that floor tiles and certain other non-friable materials do not have to be removed from a facility prior to demolition, unless they are severely damaged and Thus are considered friable, or unless the demolition may cause fiber release through grinding or abrasion of the tiles. Floor tile removal shall be done if demolition is to be accomplished by burning, either of the unit or of the debris from demolition. However, if the floors in the housing units are to be renovated, special care must be taken during the process to prevent the release of asbestos fibers.

The WESTON field team was directed, as a part of the project scope contained in the SAP, to perform sampling and analysis of specific suspect ACM. Other suspect materials observed were expansion joints on the heating units and cementitious board in the furnace rooms. Copies of the field notes are included in Appendix A.1.

2.3 LABORATORY PROCEDURES AND RESULTS

The bulk samples of building materials were analyzed for asbestos content by WESTON's optical microscopy laboratory in Auburn, Alabama. This laboratory is accredited by the American Industrial Hygiene Association (AIHA) and the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). The bulk samples were analyzed by Polarized Light Microscopy (PLM) using the EPA's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples", EPA 600/M4-82-020, December 1982. Copies of the laboratory reports are included in Appendix A.2.

Vinyl floor tile samples for which no asbestos was found using PLM methods and wipe samples of dust accumulated within heating ductwork were analyzed qualitatively for the presence of asbestos by Transmission Electron Microscopy (TEM) at WESTON's NVLAP accredited electron microscopy laboratory in Auburn, Alabama. Copies of these laboratory reports are also included in Appendix A.2.

All analyses were performed in accordance with protocols set forth in the Laboratory Accreditation package submitted by WESTON under NVLAP. This document includes standard procedures for sample analysis and quality assurance / quality control (QA/QC) which were acceptable to NIST. The QA/QC protocols for the laboratory differ significantly from those commonly found in chemical analysis procedures, due to the nature of the analytical procedure. Since there are no reagents, digestions, or other steps in the process that provide significant opportunities for sample contamination or analyte loss, lot blanks and sample spikes are not performed. Instead, all analyses are performed using the following steps:

- Incoming samples are divided into lots of ten for analysis.
- One sample is selected at random to serve as the QC check and divided into two containers.
- The sample lot is assigned to an analyst who determines the asbestos content of each sample.
- The QC sample is analyzed by a different analyst, designated by the sample custodian.
- The results of both analysts are submitted to the QC Coordinator for review, and comparison to the laboratory QC chart.
- The results are reviewed and approved, based on the written QC review procedures, or rejected. If rejected, the sample lot and QC sample are reanalyzed.

The WESTON laboratory routinely runs blank checks to ensure that equipment and refractive index oils are not contaminated, collects and analyzes samples of the air in the work areas to document that airborne asbestos fibers do not threaten worker health or contaminate samples, and analyzes samples submitted by NIST to document precision of results as required by the NVLAP program. Samples provided in past rounds of proficiency checks are used for analyst training and to document analyst proficiency. The use of third party laboratory comparisons is often done, and is accomplished by sending duplicates of samples to an outside laboratory and comparing the results obtained by the two facilities.

In interpreting the asbestos results, it should be noted that the definition of asbestos presence differs between the EPA and some state agencies. According to the EPA definition, any materials that contain greater than one per cent (>1%) asbestos are classified as ACM by the 1977 NESHAP regulations. However, California has recently implemented state regulations that consider all materials containing 0.1 per cent or more asbestos as asbestos-containing. It is believed that several other states will soon follow the lead of California in lowering the threshold limit to 0.1 per cent, including some in which properties under review in this study are located. Currently the State of Virginia continues to abide by the EPA definition, hence, all samples containing >1% asbestos are considered to be ACM.

The matter is further complicated by the fact that the PLM method was developed specifically for friable materials, but not for non-friable types of suspect ACM such as vinyl floor tiles, vinyl sheeting, and siding. In fact, no specific method has been developed and promulgated to date for such samples, so laboratories use PLM as the only available documented procedure for their analysis. PLM has an inherent limitation on fiber resolution of about 0.25 micrometer (um) in diameter, while reliable detection and quantification of fibers smaller than 1 um in diameter is difficult. The manufacturing process for vinyl floor tiles, for example, often produces the very small fiber diameters which cannot be seen by PLM. WESTON's

experience is that frequently such samples do, in fact, contain significant quantities of asbestos. WESTON has developed a qualitative technique using TEM to detect the presence of such small fibers and minimize false negatives in the laboratory results. This technique, however, does not allow a good quantitative estimate of asbestos content.

For these reasons, the WESTON laboratories have implemented a policy of reporting asbestos presence as follows:

- Asbestos determined by PLM to be present at greater than 1% is reported as the quantity detected.
- If asbestos is estimated to be less than 1% by PLM, it is reported as "<1%". This estimate of asbestos content may be made when only one asbestos structure is observed.
- If asbestos is not detected in certain non-friable materials by PLM, then the samples are subjected to TEM analysis. The results are reported as positive if asbestos is detected by TEM.

Recommendations made in this report are based on the >1% regulatory limit, except for floor tiles as discussed earlier and except as otherwise noted. However, all samples in which asbestos was detected are discussed. This represents a conservative approach to the assessment of asbestos presence at the facility.

Table 2.1 contains a summary of all samples collected at the Woodbridge FHU, including sample locations, material descriptions, and laboratory results. PLM results are quantitative while TEM results are qualitative. Quantity estimates for materials sampled that were suspected to contain asbestos are presented in Table 2.2. The field notes describing the observations are provided in Appendix A.1, while copies of the original laboratory reports are included as Appendix A.2.

Seven of the floor tile samples were found by PLM to contain asbestos at or greater than the 1% level. WESTON considers the 1% value reported for sample BY-281-25-VA-006-AFT and BY-294-25-VA-011-AFT to be sufficient to define the samples as asbestos-containing, due to the analytical uncertainty of the PLM method when applied to floor tiles, previously discussed. Two of the samples, for which no asbestos were reported following PLM analysis, were found to contain asbestos fibers by the TEM procedure. While this result is qualitative in nature, consideration of the process through which floor tiles were manufactured leads to the conclusion that this material should be treated as ACM. Thus, all of the nine floor tile samples were found to contain asbestos. The six units not inspected should be considered to have ACM present in the floor tiles unless additional sampling and analysis is performed and shows that no asbestos is present in these units.

Analytical results for the dust samples taken from the heater ductwork indicate that this dust contains some asbestos fibers. Qualitative TEM analyses revealed the presence of asbestos in six of the twelve dust samples. At least two samples from each unit had detectable asbestos fibers. These data lead to the conclusion that asbestos is found in the dust trapped by the heating ducts.

TABLE 2.1
BULK SAMPLE SUMMARY
WOODBRIDGE FAMILY HOUSING

SAMPLE IDENTIFICATION	MATERIAL TYPE	LOCATION	ASBESTOS CONTENT PLM ANALYSIS	CONFIRMATION TEM ANALYSIS
Unit 14006				
BY276-25-VA-006-ATD	Dust within ductwork	Bathroom	---	Negative
BY277-25-VA-006-ATD	Dust within ductwork	Bedroom	---	Negative
BY278-25-VA-006-ATD	Dust within ductwork	Living room	---	Positive
BY279-25-VA-006-ATD	Dust within ductwork	Entry	---	Positive
BY280-25-VA-006-AFT	Brown 9" x 9" floor tile	All rooms downstairs	Chrysotile, 15%	
BY281-25-VA-006-AFT	White 12" x 12" floor tile	Bathroom	Chrysotile, 1%	
Unit 14002				
BY282-25-VA-002-ATD	Dust within ductwork	Bedroom	---	Positive
BY283-25-VA-002-ATD	Dust within ductwork	Bedroom	---	Positive
BY284-25-VA-002-ATD	Dust within ductwork	Living room	---	Negative
BY285-25-VA-002-ATD	Dust within ductwork	Kitchen	---	Negative
BY286-25-VA-002-AFT	Brown 9" x 9" floor tile	Living room/Hall	Chrysotile, 15%	
BY287-25-VA-002-AFT	Yellow 12" x 12" floor tile	Kitchen	Chrysotile, 7%	
BY288-25-VA-002-AFT	White 12" x 12" floor tile	Bathroom	None Detected	Positive
Unit 14011				
BY289-25-VA-011-ATD	Dust within ductwork	Bedroom	---	Positive
BY290-25-VA-011-ATD	Dust within ductwork	Bedroom	---	Positive
BY291-25-VA-011-ATD	Dust within ductwork	Living room	---	Negative
BY292-25-VA-011-ATD	Dust within ductwork	Kitchen	---	Negative
BY293-25-VA-011-AFT	Gray 9" x 9" floor tile	Bedrooms/Kitchen/Hall	Chrysotile, 3%	
BY294-25-VA-011-AFT	Black 9" x 9" floor tile	Living room	Chrysotile, 1%	
BY295-25-VA-011-AFT	Green 9" x 9" floor tile	Bathroom	Chrysotile, 15%	
BY296-25-VA-011-AFT	White 12" x 12" floor tile	Heater room	None Detected	Positive

TABLE 2.2
ASBESTOS CONTAINING MATERIALS
WOODBRIDGE FAMILY HOUSING

SAMPLE IDENTIFICATION	MATERIAL TYPE	LOCATION	QUANTITY	UNITS
Unit 14006				
BY278-25-VA-006-ATD	Dust within ductwork	Living room	N/A	
BY279-25-VA-006-ATD	Dust within ductwork	Entry	N/A	
BY280-25-VA-006-AFT	Brown 9" x 9" floor tile	All rooms downstairs	400	Square ft
BY281-25-VA-006-AFT	White 12" x 12" floor tile	Bathroom	30	Square ft
Unit 14002				
BY282-25-VA-002-ATD	Dust within ductwork	Bedroom	N/A	
BY283-25-VA-002-ATD	Dust within ductwork	Bedroom	N/A	
BY286-25-VA-002-AFT	Brown 9" x 9" floor tile	Living room/Hall	280	Square ft
BY287-25-VA-002-AFT	Yellow 12" x 12" floor tile	Kitchen	120	Square ft
BY288-25-VA-002-AFT	White 12" x 12" floor tile	Bathroom	30	Square ft
Unit 14011				
BY289-25-VA-011-ATD	Dust within ductwork	Bedroom	N/A	
BY290-25-VA-011-ATD	Dust within ductwork	Bedroom	N/A	
BY293-25-VA-011-AFT	Gray 9" x 9" floor tile	Bedrooms/Kitchen/Hall	560	Square ft
BY294-25-VA-011-AFT	Black 9" x 9" floor tile	Living room	375	Square ft
BY295-25-VA-011-AFT	Green 9" x 9" floor tile	Bathroom	75	Square ft
BY296-25-VA-011-AFT	White 12" x 12" floor tile	Heater room	30	Square ft

2.4 CONCLUSIONS AND RECOMMENDATIONS

The sample analyses performed by WESTON have revealed that asbestos is present in most floor tile samples collected in the three housing units examined and that the dust inside the heater supply ducts contains asbestos. These units are thought to be representative of the other six at the site, but this was not confirmed by sampling all units.

The asbestos dust accumulated within the heating ductwork represents an unusual problem, since the source of this asbestos is not readily apparent, and the quantity is not precisely known. As a conservative approach, the heating ductwork located within the concrete slab should be cleaned or permanently sealed when the units are renovated. Since the heating systems are currently operational, sealing the floor vents will require replacement with attic ducts and ceiling vents, or provisions of an alternate heating source. If the ducts are cleaned, a high-powered vacuum cleaner equipped with a high-efficiency particulate air (HEPA) filter should be employed, since other vacuum cleaners are not capable of trapping all of the small asbestos fibers that may be present.

The source of the asbestos in the ducts cannot be positively determined, due to the sampling and analysis procedures employed. However, there are several potential sources, based on observations at the numerous facilities inspected during this project. Units, presumed to be the original heaters, found at other facilities frequently contained an expansion joint which served to isolate the return air plenum from the heater itself, preventing the transmission of vibrations and noise to the ductwork. The fabric-like material used to form this joint was determined, in some cases, to be chrysotile asbestos in a nearly pure form. It is possible, even likely, that the heating systems in these units had similar expansion joints which have been removed. During the 25 to 30 years that the original units were in service, erosion of these joints was likely, and could have caused asbestos fibers to accumulate in the dust.

Another possibility is that residual debris from the removal of vinyl-asbestos floor tiles, such as was found in other sites, may have been left in the ducts during floor tile removal and replacement. Conversations with the TEM analysis indicate that there was some evidence of chlorine observed during the identification of the asbestos fibers by X-ray dispersion analysis in samples from some sites. The most likely source of this element, considering the site history, is the vinyl chloride polymer which forms the floor tile matrix. However, other asbestos sources, such as debris imported into the facilities from outside activities of the occupants, cannot be ruled out.

The vinyl floor tiles in the three housing units inspected were in good condition, but, should they become broken or damaged, asbestos fibers may be released. The recent EPA clarification of the definition for damaged non-friable materials apparently removes some concerns about the status of these materials at the time of renovation or demolition. Inspection of these normally non-friable materials prior to demolition is required, but, if they are in good condition at the time, they may be left in place as long as planned demolition procedures will not release a significant amount of asbestos fibers. However, if demolition will subject these non-friable materials to grinding, sanding, or abrading, or if demolition involves burning of the structure or debris from the structure, all forms of ACM, including these floor tiles, must be removed in advance.

The vinyl floor coverings should be left in place and managed under an O&M program. An O&M program must address the following:

- The locations of all known and suspected ACM.
- The procedures and frequency for periodically assessing the ACM in the facility.
- The procedures for safely handling the ACM during maintenance or removal activities.
- Designation of an asbestos coordinator for the facility.
- The responsibilities and requirements for training of personnel involved with maintenance and renovation of the facility.
- The record-keeping program for the facility.

The vinyl floor tiles should be removed during a planned renovation of the units, in accordance with the regulations applicable at the time.

Other suspect materials noted were roofing materials, expansion joints in the heating units, and cementitious board in the furnace rooms. Care should be taken during renovations or demolition to identify suspect materials that may have been hidden from the view of the assessment team. The suspect materials observed by the field team, and any hidden suspect materials found later, should be analyzed for the presence of asbestos prior to being disturbed.

SECTION 3. AIRBORNE ASBESTOS ASSESSMENT

SECTION 3. AIRBORNE ASBESTOS ASSESSMENT

Sampling for airborne asbestos fibers was performed at one unit of the Woodbridge, Virginia FHU on 27 April 1990 by WESTON. Dr. Leonard Nelms, a Certified Industrial Hygienist (CIH) visited the site and collected the samples using procedures described in the Asbestos Hazard Emergency Response Act (AHERA). These procedures were designed for verifying that clean-up of a contained area, following completion of an asbestos abatement action in public schools, was adequately performed. All samples were analyzed by TEM following the protocols specified in AHERA.

3.1 SAMPLING RATIONALE

WESTON followed the procedures and guidelines set forth during discussions among ANL, USATHAMA, and WESTON staff members, to provide a fast-track field sampling program and rapid analysis of samples collected. The urgency of this effort was driven by the finding that asbestos fibers were a component of the dust contained in the sub-slab ductwork of a number of the installations. The approach chosen required that the WESTON CIH collect four samples of air from selected heating registers, generally from one in each of the living room, kitchen, bedroom, and bathroom. Air samples were to be collected in one unoccupied unit at the site while the heating system was operating, to simulate the worst possible case for exposure of occupants. The vacant unit selected was to be one of those from which dust within ducts had been sampled during the initial investigations, where possible. If no unit that had been sampled previously was vacant at the time, another unit was to be chosen from among those available, and samples of dust from the ducts were to be collected. These samples were to be collected after completion of sampling for airborne fibers, using the procedures employed previously. Unit 14006, a two-story townhouse-type unit was selected at the Woodbridge site, since it was vacant and had previously been sampled.

3.2 FIELD ACTIVITIES AND OBSERVATIONS

The sampling activities at this site were performed during the morning on a warm spring day. The diaphragm pumps were unpacked, placed in the selected sampling locations, and turned on as soon as possible after arrival at the site to allow the mechanical components to warm up prior to checking flow rates. Since there were no floor ducts in this unit and no duct at all in the kitchen, samples were taken from wall vents in the three remaining locations in the plan and from the ceiling vent in the hallway at the kitchen door. The heating system was turned on as soon as the pumps were in operation, to allow the air flow to stabilize, since it had not been in operation recently.

A test filter cassette, identical to those used for sample collection, was placed on the pump system being calibrated and the airflow into the filter was measured using a calibrated rotameter. This followed AHERA requirements and good industrial hygiene (IH) sampling protocols. After the pumps were calibrated, a sampling cassette made of an electrically conducting plastic was attached to the sample line, placed directly over the heating register to be sampled, and securely held in place with duct tape. The cassette contained a 25 mm diameter mixed cellulose ester (MCE) membrane filter, having a nominal pore size of 0.45 um. The time at which sample collection was begun was recorded and the air was sampled for approximately three hours.

The pumps were operated for a length of time sufficient to draw about 1,600 liters (L) of air through each filter, based on the initial daily calibration. At the expiration of this time, the filter cassettes were removed from the heating register, inverted while the airflow continued, and lightly tapped to dislodge any fibers that may have adhered to the cowling of the cassette. Then, the cassettes were carefully removed from the sampling pump, resealed with the plugs and end caps that are a part of the cassettes, and labeled. The flow rate of each pump was again determined by exactly the same procedure used prior to the start of sample collection. After all sampling was completed, the heating system was returned to the same condition and setting that was found on entry to the unit.

The volume of air drawn through each filter was calculated, based on the average sample flow rate and the duration of sample collection, and recorded on the cassette label. Each cassette was then sealed in a anti-static plastic zipper-seal bag and placed in a shipping carton with a custom-designed anti-static foam liner. All sampling equipment, samples and other gear were then removed from the unit and the site was secured prior to departure.

Samples were collected from the four interior locations selected and described earlier. In addition, a field blank was prepared and a background sample of ambient outside air was taken at the front of the house outside of the kitchen window. No significant problems were encountered during the sample collection activities.

During the sampling effort the facility was examined to identify any potential sources of asbestos that may be responsible for the asbestos fibers found in the dust. The heating system had been replaced and no insulation or expansion joints were noted.

3.3 LABORATORY PROCEDURES AND RESULTS

Samples were shipped to the laboratory soon after collection by common carrier. The four samples of air from within the unit were analyzed by WESTON's NVLAP-accredited TEM facility, using the sample preparation and analytical procedures set forth in the EPA AHERA method. A section of the exposed filter was cut from each sample and three wedges were placed on copper wire grids for TEM mounting. The samples were etched in a plasma asher, which also destroyed some of the organic materials that may have been collected, and vacuum-coated with a thin layer of carbon, embedding the fibers that were on the filter surface. Each carbon-coated grid was placed in a Jaffe wick washer, in which the MCE filter matrix was dissolved and wicked away, leaving behind the carbon film containing any asbestos fibers collected. The grids were then examined and found to be ready for analysis.

Once the sample grids were prepared, each grid was examined by the TEM protocols of AHERA. A specified number of grid openings were scanned looking for fibers that may be asbestos. Typically, between six and ten grid openings had to be examined to comply with the detection limits set forth in the regulations. Whenever a fiber was observed during this examination, the microscopist examined its morphology and determined its elemental composition from the emitted X-ray spectrum. If these indicated that it may be an asbestiform mineral, the crystal lattice structure was examined by observation of its electron diffraction pattern. The fiber was then classified as non-asbestos or by the type of asbestos determined to be present during the analysis, as appropriate.

The results for the four samples from inside Unit 14006 are presented in Table 3.1. One asbestos fiber was detected in the sample from the ceiling vent in the hallway. No other samples were found to contain asbestos at the limit of detection of the method, between 0.004 and 0.005 fibers per cubic centimeter (f/cc). The background sample and field blank from this site were examined, since asbestos fibers were detected inside the unit, which had no floor vents. No asbestos structures were found in either of these samples.

3.4 CONCLUSIONS AND RECOMMENDATIONS

The air samples collected indicate that, although an asbestos fiber was found in one sample from this unit, fibers in the dust found within the heating system ductwork are not being released in significant quantities at this facility. The average airborne asbestos concentration was lower than the detection limit and below the AHERA threshold. The limits of detection were all at or below the acceptability limit set forth in AHERA, corresponding to 0.005 f/cc for clearance of an abatement area in a school, and were far lower than the OSHA Permissible Exposure Limit (PEL) for workers of 0.2 f/cc.

While asbestos has been shown to pose a health risk to humans at high fiber concentrations, there are no definitive studies that indicate that a risk is associated with low-level exposures such as the 0.005 f/cc AHERA limit. Therefore, sampling and analysis for airborne asbestos at this site did not reveal any health risk to the occupants of the houses, based on the TEM analyses of the samples collected. However, it is recommended by the U.S. Army Environmental Hygiene Agency (AEHA) that, if the units are to remain under the management, operational control, or ownership of the Army, additional sampling and analysis for airborne asbestos be undertaken. These studies should be performed to provide data from at least ten percent or a minimum of three of the housing units, whichever is greater. This additional sampling and analysis effort, along with the other recommended actions, will help to ensure that there is no long-term exposure risk to the occupants or to maintenance personnel.

TABLE 3.1. RESULTS OF AIRBORNE ASBESTOS SAMPLING AND ANALYSIS
(ALL VALUES IN FIBERS/CC)

SAMPLE NUMBER	SAMPLE LOCATION	ASBESTOS IN DUST	ASBESTOS CONCENTRATION	ASBESTOS TYPE FOUND
WB-06-LR	Living Room	YES	ND <0.005	ND
WB-06-HA	Entry Hallway	YES	0.005	Chrysotile
WB-06-BR	Bed Room	NO	ND <0.004	ND
WB-06-BA	Bath Room	NO	ND <0.005	ND
WB-06-OUT	Outside (Background)	--	ND <0.005	ND
WB-06-FB	Field Blank	--	ND	ND

ND = Not Detected at the Limit of Detection Cited.
Note: The asbestos in all dust samples was chrysotile.

SECTION 4. SUMMARY OF FINDINGS

SECTION 4. SUMMARY OF FINDINGS

Sampling and analyses performed at the Woodbridge, Virginia FHU reveal the presence of issues of concern from an environmental standpoint. The most significant are the detection of asbestos in six of the 12 dust samples and in all nine samples of floor tile.

The following practices should be observed with regard to the known and suspected asbestos-containing materials identified:

- The vinyl floor coverings pose no significant risk as long as they are in good condition and are not damaged by excessive wear or misuse. They should be left in place and managed under an O&M program which describes procedures for the regular inspection of the floor coverings and the removal and replacement of any that become damaged.

- Additional sampling and analysis for airborne asbestos at this site is recommended by AEHA, if the units are to remain under the management, operational control, or ownership of the Army. These studies should be performed to provide data from at least ten percent or a minimum of three of the housing units, whichever is greater.

The air monitoring performed in Unit 14006 indicated that asbestos was being emitted in air from the heating duct in the ceiling of the entry hallway near the kitchen. One chrysotile cluster was found during TEM analysis, which results in a calculated asbestos concentration of 0.005 f/cc. This is also the detection limit of the method. Since no other asbestos was found, the average concentration, <0.005 f/cc, is below the AHERA limit and well below the OSHA PEL of 0.2 f/cc. The risks to occupants of such levels of exposure is currently believed to be minimal.

APPENDIX A.1. FIELD DATA, ASBESTOS SAMPLING

SITE SURVEY LOG

CLIENT Argonne National Labs WESTON WORK ORDER NO. 2104-13-01

FACILITY/BLDG. NO. Woodbridge FHU # 006

FACILITY CONTACT Donna Neese TELEPHONE NUMBER 703-664-2904

TECHNICIAN NAME L. Jaye SIGNATURE [signature]

TECHNICIAN NAME A. Busby SIGNATURE [signature]

TIME ARRIVED 1000 TIME DEPARTED 1030 DATE 26 FEB 90
dd mmm yy

SPECIFIC SITE ACTIVITIES, COMMENTS, INTERVIEW RESULTS & BRIEF DESCRIPTION OF FACILITY

Unit 006 is a 2-story, 2-bedroom house with red brick and wood siding. Heat is forced air oil fire. There was no pipe insulation to sample. Dust samples and floor tile were taken. Downstairs has vinyl floor tile, but upstairs bedrooms are hardwood floor. Transite board (9 sq') was noted in the utility room but not sampled. Unit was empty and unoccupied at the time of our inspection.

The air that is drawn into the furnace room comes through a hole that was cut in the center of transite board that separates the furnace from a small storage area.

ACTIVITY CHECKLIST

Interviews Completed	✓	Number of Samples	6
Drawings Reviewed	✓	Survey Form Completed	✓
Drawings Attached	✓	Site Log Completed	✓
Visual Inspection	✓	Chain-of-Custody Initiated	✓
Number of Photos	0	Exp. Assess. Form Init.	✓

Q.A. Check ____ SIGNATURE ____ DATE ____/____/90
dd mmm yy

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WESTON

ASBESTOS SURVEY DATA

0575

BLDG. NO.: 0016
INSTALLATION 0215

TASK TEAM MEMBERS
L. Jaye
A. Busby

W.O. No. 2104-13-01
CLIENT: ARGONNE NATIONAL A

BLDG. NAME: Woodbridge FH4
BLDG. DESCRIPTION: 2-bedroom, red brick

DATE (dd/mm/yy): 26/FEB/90
TIME ARRIVED: 1000

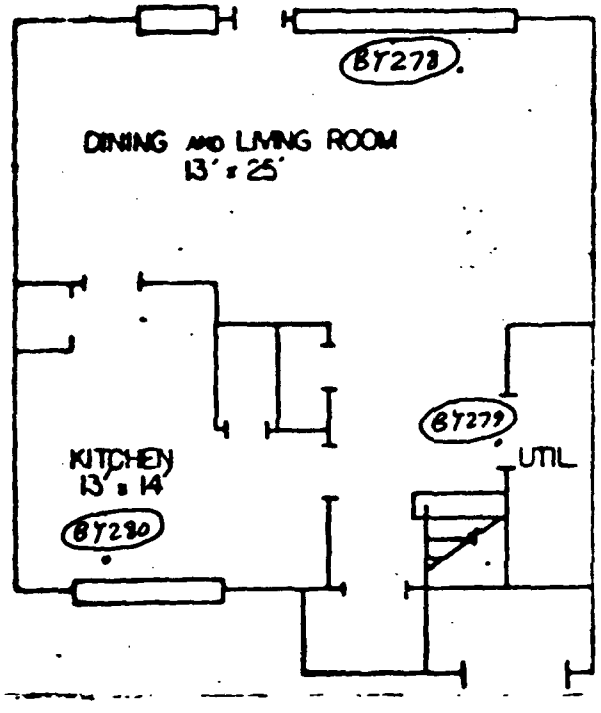
ITEM NO.	LAB SAMPLE NO.	BASE NO.	STATE	UNIT NO.	SAMPLE CODE	AREA	QUANTITY	PHOTO	E.A. FORM NO.	NOTES
1.	B412776	215	VA	0016	AITD	BATHROOM	1		101924A	01
2.	B412777	215	VA	0016	AITD	BEDROOM	1		101921A	01
3.	B412778	215	VA	0016	AITD	LIVING ROOM	1		101921A	01
4.	B412779	215	VA	0016	AITD	ENTRY	1		101921A	01
5.	B412780	215	VA	0016	AIFT	KITCHEN	400		101921B	02
6.	B412781	215	VA	0016	AIFT	BATHROOM	30		101924C	03
7.					AI					
8.					AI					
9.					AI					
10.					AI					
11.					AI					
12.					AI					

NOTE NO.	NOTES/REMARKS/COMMENTS/DETAILS/OTHER MATERIALS, QUANTITY, ETC.
01	Dust Samples in wall vents
02	Brown 9x9 floor tile all rooms downstairs (Square Feet)
03	White 12x12 floor tile (Square feet)

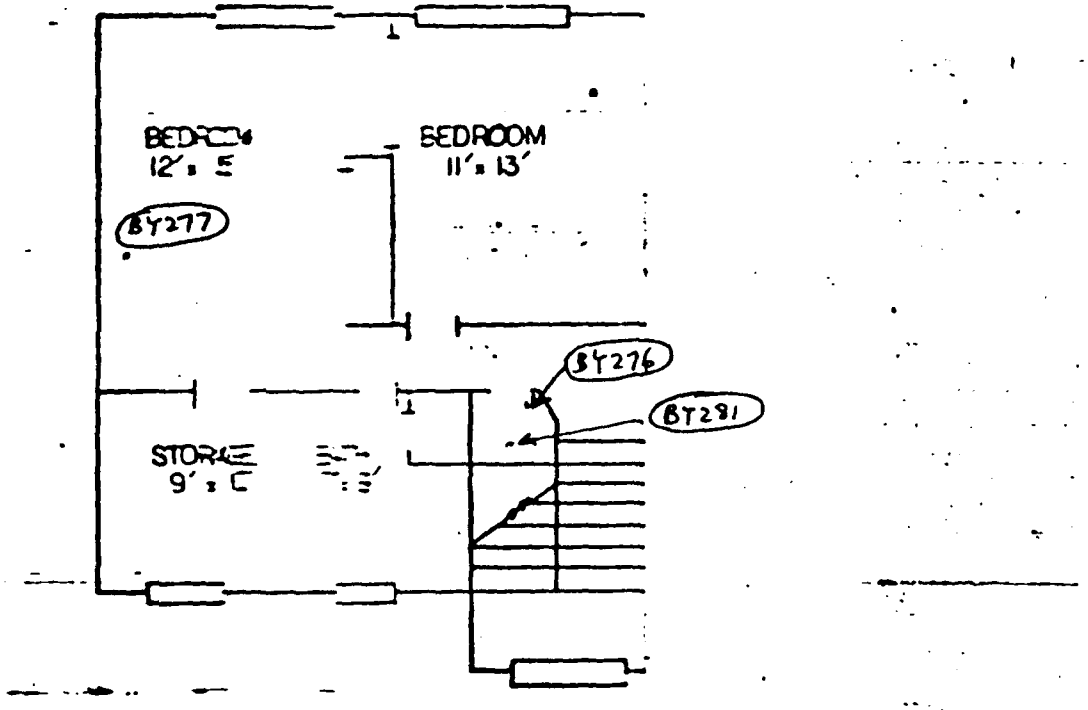
TECHNICIAN SIGNATURE L. Jaye

QUALITY ASSURANCE SIGNATURE

Woodbridge # 14006



FIRST FLOOR PLAN



SECOND FLOOR PLAN

14000 AREA (WOODBRIDGE)
2 BR - TWO STORY
QTRS. 14000, 14004 AND 14006

BLDG# 6
SITE# 25
WOODBRIDGE VA

0577

SITE SURVEY LOG

CLIENT Argonne National Labs WESTON WORK ORDER NO. 2104-13-01

FACILITY/BLDG. NO. Woodbridge FH4 # 002

FACILITY CONTACT Donna Reese TELEPHONE NUMBER ~~804~~ 703-664-2904

TECHNICIAN NAME L. Jaye SIGNATURE [signature]

TECHNICIAN NAME A. Busby SIGNATURE [signature]

TIME ARRIVED 1030 TIME DEPARTED 1100 DATE 26 FEB 90
dd mmm yy

SPECIFIC SITE ACTIVITIES, COMMENTS, INTERVIEW RESULTS & BRIEF DESCRIPTION OF FACILITY

Unit #002 is a two-story 3-bedroom brick house. Heat is forced air oil fire. No pipe insulation was noted. Dust samples and flour tile sample were taken. Suspect transite board (9 sq') noted in Utility room. Bedrooms upstairs were hardwood floors. House was empty and unoccupied during our inspection.

ACTIVITY CHECKLIST

Interviews Completed	✓	Number of Samples	7
Drawings Reviewed	✓	Survey Form Completed	✓
Drawings Attached	✓	Site Log Completed	✓
Visual Inspection	✓	Chain-of-Custody Initiated	✓
Number of Photos	0	Exp. Assess. Form Init.	✓
Q.A. Check	✓	SIGNATURE Michael Skotnicki	DATE 20 MAR 90 (dd mmm yy)

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WESTON

ASBESTOS SURVEY DATA

057

BLDG. NO.: 0012
INSTALLATION 0715

TASK TEAM MEMBERS
L. Jaye
A. Bushy

W.O. No. 2104-13-01
CLIENT: ARGONNE NATIONAL A

BLDG. NAME: Woodbridge FH4
BLDG. DESCRIPTION: 3-bedroom, red brick

DATE (dd/mm/yy): 26/FEB/90
TIME ARRIVED: 1030

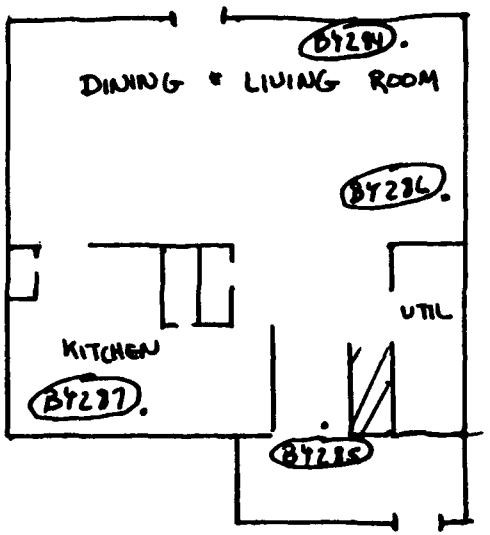
ITEM NO.	LAB SAMPLE NO.	BASE NO.	STATE	UNIT NO.	SAMPLE CODE	AREA	QUANTITY	PHOTO	E.A. FORM NO.	NOTES
1.	B1712812-215-VIA-0012-AITD					BEDROOM	111	_	1019131A	01
2.	B1712813-215-VIA-0012-AITD					BEDROOM	111	_	1019131A	01
3.	B1712814-215-VIA-0012-AITD					LIVING ROOM	111	_	1019131A	01
4.	B1712816-215-VIA-0012-AITD					ENTRY	111	_	1019131A	01
5.	B1712817-215-VIA-0012-AIFT					LIVING ROOM	289	_	1019131B	02
6.	B1712817-215-VIA-0012-AIFT					KITCHEN	129	_	1019131C	03
7.	B1712818-215-VIA-0012-AIFT					BATHROOM	30	_	1019131D	04
8.	____-_-_-__-A__						___	_	____	_
9.	____-_-_-__-A__						___	_	____	_
10.	____-_-_-__-A__						___	_	____	_
11.	____-_-_-__-A__						___	_	____	_
12.	____-_-_-__-A__						___	_	____	_

NOTE NO.	NOTES/REMARKS/COMMENTS/DETAILS/OTHER MATERIALS, QUANTITY, ETC.
01	Dust Samples from wall vents
02	Floor sq. ft. [illegible] (square feet)
03	Yellow 12X12 floor tile in kitchen (square feet)
04	White 12X12 floor tile (square feet)

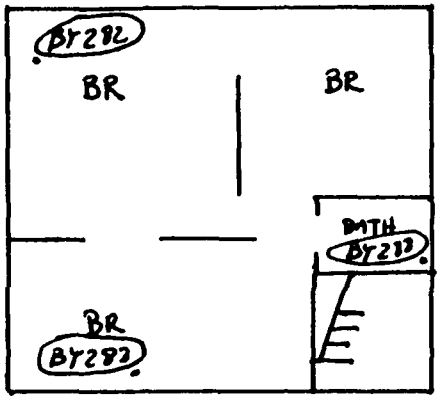
TECHNICIAN SIGNATURE Jaye

QUALITY ASSURANCE SIGNATURE

WOODBRIDGE # 14022



FIRST FLOOR PLAN



SECOND FLOOR PLAN

SITE SURVEY LOG

CLIENT Argonne National Labs WESTON WORK ORDER NO. 2104-13-01

FACILITY/BLDG. NO. Woodbridge FHA # 011

FACILITY CONTACT Donna Nerse TELEPHONE NUMBER 703-664-2904

TECHNICIAN NAME L. Jaye SIGNATURE L. Jaye

TECHNICIAN NAME A. Busby SIGNATURE A. Busby

TIME ARRIVED 1100 TIME DEPARTED 1130 DATE 26/FEB/90
dd mmm yy

SPECIFIC SITE ACTIVITIES, COMMENTS, INTERVIEW RESULTS & BRIEF DESCRIPTION OF FACILITY

Unit # 011 is a 2-bedroom brick house. Heat is forced air oil fire. No pipe insulation was seen. Suspect ACM expansion joint was noted on heater in heater room. Dust samples and floor tile was sampled. Unit was occupied at the time of our inspection.

ACTIVITY CHECKLIST

Interviews Completed	✓	Number of Samples	8
Drawings Reviewed	✓	Survey Form Completed	✓
Drawings Attached	✓	Site Log Completed	✓
Visual Inspection	✓	Chain-of-Custody Initiated	✓
Number of Photos	0	Exp. Assess. Form Init.	✓

Q.A. Check ✓ SIGNATURE Michael Skotnicki DATE 20 MAR/90
dd mmm yy

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WESTON

ASBESTOS SURVEY DATA

0583

BLDG. NO.: 0111
INSTALLATION: 0215

TASK TEAM MEMBERS
L. Jaye
A. Busby

W.O. No. 2104-13-01
CLIENT: ARGONNE NATIONAL LAB

BLDG. NAME: Woodbridge FHU.
BLDG. DESCRIPTION: 2-bedroom, red brick

DATE (dd/mm/yy): 26/FEB/90
TIME ARRIVED: 1100

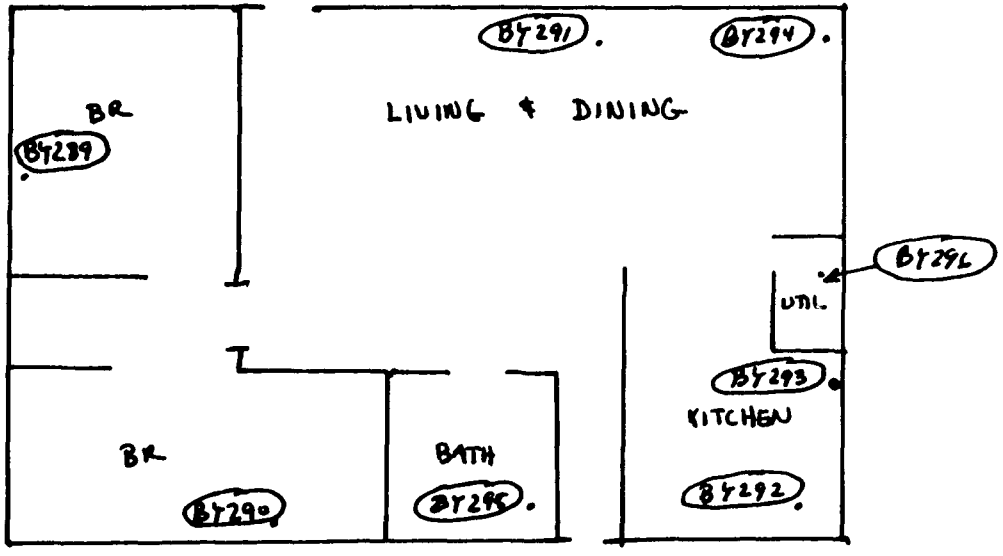
ITEM NO.	LAB SAMPLE NO.	BASE NO.	STATE	UNIT NO.	SAMPLE CODE	AREA	QUANTITY	PHOTO	E.A. FORM NO.	NOTES
1.	84289	25	VA	011	ATD	BEDROOM			L0944A	01
2.	84290	25	VA	011	ATD	BEDROOM			L0944A	01
3.	84291	26	VA	011	ATD	LIVING ROOM			L0944A	01
4.	84292	25	VA	011	ATD	KITCHEN			L0944A	01
5.	84293	25	VA	011	AFT	KITCHEN	560		L0944B	02
6.	84294	25	VA	011	AFT	LIVING ROOM	375		L0944C	03
7.	84295	25	VA	011	AFT	BATHROOM	175		L0944D	04
8.	84296	26	VA	011	AFT	HEATER ROOM	139		L0944E	05
9.					A					
10.					A					
11.					A					
12.					A					

NOTE NO.	NOTES/REMARKS/COMMENTS/DETAILS/OTHER MATERIALS, QUANTITY, ETC.
01	Dust samples in wall vents
02	Gray 9x9 floor tile brs, kitchen, hall (square feet)
03	Black 9x9 floor tile (square feet)
04	Green 9x9 floor tile (square feet)
05	White 12x12 floor tile (square feet)

TECHNICIAN SIGNATURE: [signature]

QUALITY ASSURANCE SIGNATURE:

WOODBRIDGE 14011



APPENDIX A.2. LABORATORY DATA, ASBESTOS SAMPLES

BULK SAMPLE ANALYSIS SUMMARY

Weston W.O. No. 2104-13-01-0000

Sample Number BY280 through Sample BY296

AO LAB ID NO	CLIENT/CLIENT ID	LOCATION	MATERIAL DESCRIPTION*	DATE RECEIVED	RESULTS** CH	AM	CR	OT	TL	LAYERS	ANALYST
BY280	25-VA-006-AFT	KITCHN	NF, BR, 9X9 FT	03/01/90	15	ND	ND	ND	15	Yes	07323
BY281	25-VA-006-AFT	BATHRM	NF, WH, 12X12 FT	03/01/90	1	ND	ND	ND	1	Yes	07323
BY286	25-VA-002-AFT	LIVNRM	NF, BR, 9X9 FT	03/01/90	15	ND	ND	ND	15	Yes	07323
BY287	25-VA-002-AFT	KITCHN	NF, YL, 12X12 FT	03/01/90	7	ND	ND	ND	7	No	07323
BY288	25-VA-002-AFT	BATHRM	NF, WH, 12X12 FT	03/01/90	ND	ND	ND	ND	ND	No	07323
BY293	25-VA-011-AFT	KITCHN	NF, GY, 9X9 FT	03/01/90	3	ND	ND	ND	3	Yes	07323
BY294	25-VA-011-AFT	LIVNRM	NF, BK, 9X9 FT	03/01/90	1	ND	ND	ND	1	Yes	07323
BY295	25-VA-011-AFT	BATHRM	NF, GR, 9X9 FT	03/01/90	15	ND	ND	ND	15	Yes	07323
BY296	25-VA-011-AFT	HEATRM	NF, WH, 12X12 FT	03/01/90	ND	ND	ND	ND	ND	Yes	07323

* MATERIAL DESCRIPTION

Friable[1], Color[2], System[3], Type

** RESULTS

CH - Chrysotile
AM - Amosite
CR - Crocidolite
OT - Other
TL - Total

FRIABLE[1]

F - Friable
NF - Non-Friable

COLOR[2]

BK - Black
BL - Blue
BR - Brown
GR - Green
GY - Gray
RD - Red
TN - Tan
WH - White
YL - Yellow

SYSTEM[3]

CHW - Chilled Water
DOM - Domestic Water
HHW - Heating Hot Water
STM - Steam
UNK - Unknown

All analyses are performed in accordance with the methods set forth in U.S. EPA 600/M4-82-020, as ammended. Weston's Optical Microscopy Laboratory is accredited by the National Institute of Standards and Technology's National Voluntary Laboratory Accreditation Program for asbestos fiber analysis (Laboratory Code 1254).

ROY F. WESTON, INC.
1635 PUMPHREY AVE.
AUBURN, AL 36830
PHONE: (205) 826-6100
FAX: (205) 826-8232

Transmission Electron Microscopy
Asbestos Summary Report

Client: Argonne National Laboratories Weston W.O. No.: 2104-13-01-0000

Sample Type(s): Dust and Floor Tiles Sampling Location: Woodbridge

QUALITATIVE ANALYSIS

FLOOR TILES: A 0.5 to 2.0 gram portion of each floor tile sample was ultrasonically disaggregated in four milliliters of deionized, 0.2 μm membrane filtered water. After the coarse fraction settled, a drop of the suspended, clay-sized fraction was placed on a Formvar coated 200 mesh Cu TEM grid and allowed to dry. The grid was carbon coated for thermal stability in the electron beam and examined with a Philips CM12 transmission electron microscope operating at 120 kilovolts accelerating voltage.

DUST WIPE SAMPLES: A generous loading of dust was collected on a pre-wetted, 25 square centimeter section of a cleanroom wipe. The wipe was placed in a two ounce wide mouth collection vial and returned to the laboratory. Ten to fifteen milliliters of filtered, deionized water was added to suspend the dust. The suspension was ultrasonically dispersed and the coarse fraction was allowed to settle. A drop of the suspension was placed on a Formvar coated 200 mesh Cu TEM grid and allowed to dry. The grid was carbon coated as above and examined by transmission electron microscopy at 120 kilovolts accelerating voltage.

ANALYTICAL RESULTS

SAMPLE IDENTIFICATION	RESULTS
BY276-25-VA-006-ATD	Negative
BY277-25-VA-006-ATD	Negative
BY278-25-VA-006-ATD	Positive
BY279-25-VA-006-ATD	Positive
BY282-25-VA-002-ATD	Positive
BY283-25-VA-002-ATD	Positive
BY284-25-VA-002-ATD	Negative

ROY F. WESTON, INC.
1635 PUMPHREY AVE.
AUBURN, AL 36830
PHONE: (205) 826-6100
FAX: (205) 826-8232

ANALYTICAL RESULTS
(continued)

SAMPLE IDENTIFICATION	RESULTS
BY285-25-VA-002-ATD	Negative
BY288-25-VA-002-AFT	Positive
BY289-25-VA-011-ATD	Positive
BY290-25-VA-011-ATD	Positive
BY291-25-VA-011-ATD	Negative
BY292-25-VA-011-ATD	Negative
BY296-25-VA-011-AFT	Positive

Barry Rayfield — 3/19/90
(Approved for transmittal) — (Date)

* This test report relates only to the specific items tested.
** These sample results may only be reproduced in full, and are valid only if approved for transmittal.

APPENDIX B.1. FIELD DATA, AIRBORNE ASBESTOS SAMPLING

FIELD NOTES FOR WOODBRIDGE, VA

The Woodbridge, Virginia site consists of seven two-story units which are identical in floor plan and layout to those at Croom, Maryland. In addition there were two single story units. However, the representive of the DEH did not have keys to enter the single story units so sampling was performed in unit 14006. This unit consisted of a town-house type structure located in the center of the building. The lower level is slab on grade and contains the living room and dining area. The kitchen, the entry foyer, the lower level stairway and the mechanical room contained the heater and the hot water heater. This unit, like that at Croom, was also air-conditioned. The concrete slab was covered by a rose colored 9 x 9 floor tile with white and occasional blue streaks. Several other types of floor tile was also present in single or small numbers where this original floor tile had been patched. The upstairs and the stairwell are hardwood except for the bathroom which is ceramic tile floored. The upstairs consists of a small bedroom opening at the top of the stairs and the master bedroom which has a large walk in room which could be used as a third bedroom for a small child. Samples were collected from the same ducts which were sampled during the initial asbestos survey. These included the hall vent in the ceiling of the entry hallway, the living room vent located next to the utility room near the hall, the bathroom vent located upstairs beneath the bathroom sink, and the master bedroom vent located in the wall dividing the two bedrooms. In addition, an outside sample was collected on the outside wall near the kitchen window. The mechanical room in this unit did not have insulation on the pipes. The only insulation noted there was the foam rubber insulation on the refrigeration line from the air conditioning unit. The site was reached at 7:30 and the DEH representative arrived at approximately 7:45. Sampling pumps had already been prepared and were set up and calibrated with sampling commencing at 8:00. Samples were collected until approximately 10:30 at which time the sampling was completed. Samples and pumps were packed for shipment. The site was departed at 11:00.

AIR MONITORING DATA

CLIENT Argonne Nat'l Lab WORKER ORDER NUMBER 2104-13-02

PROJECT LOCATION Woodbridge VA Unit 14006

WORK AREA ID NO _____ SAMPLE # WB-06-LR

SAMPLE TYPE

PERSONAL AMBIENT

X Living Room Vent (wall)

SAMPLE DATA 0810 1030 140

97 X L. Nelms 27 Apr. '90

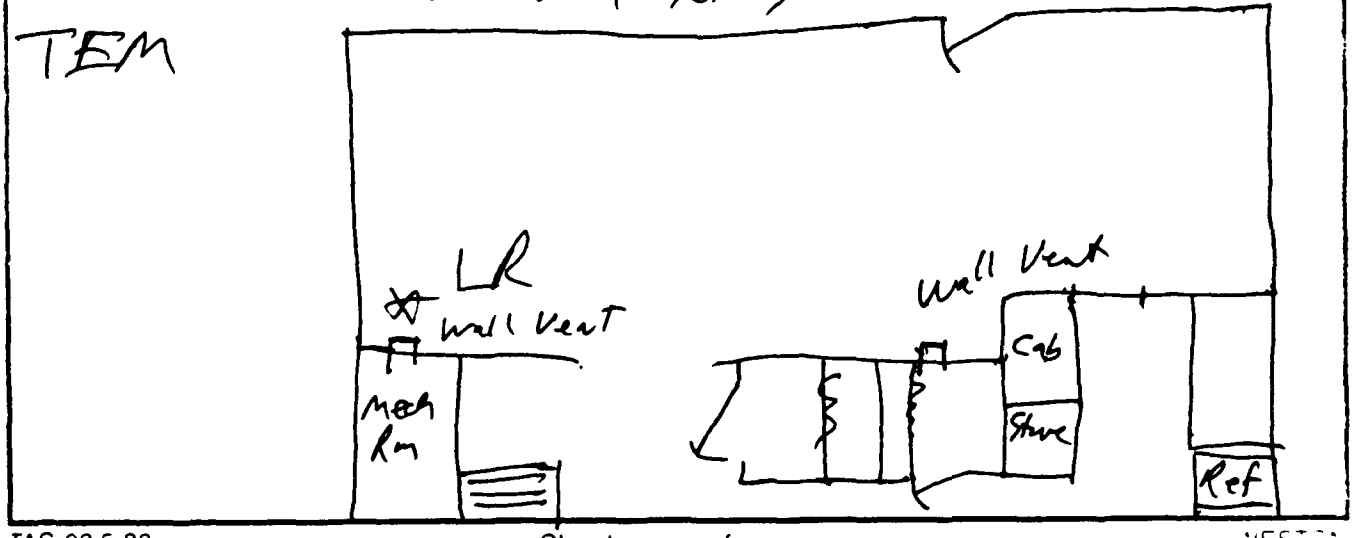
23 11.4 11.4

24 11.4 1600

ANALYTICAL DATA

Date

NOTES SKETCHES REMARKS Fan only getting TEM



TAS-03 5-88
GEN TECH ASB

Sheet ____ of ____

WESTON

AIR MONITORING DATA

CLIENT Argonne Nat'l Lab WORKER ORDER NUMBER 2104-13-02

PROJECT LOCATION Woodbridge VA, Unit 14006

WORK AREA ID NO. _____ SAMPLE # WB-06-1HA

SAMPLE TYPE

PERSONNEL AMBIENT

X Hall Vent (ceiling)

SAMPLE DATA

0811 1033 142

L. Nelms 27 Apr '90

X

82

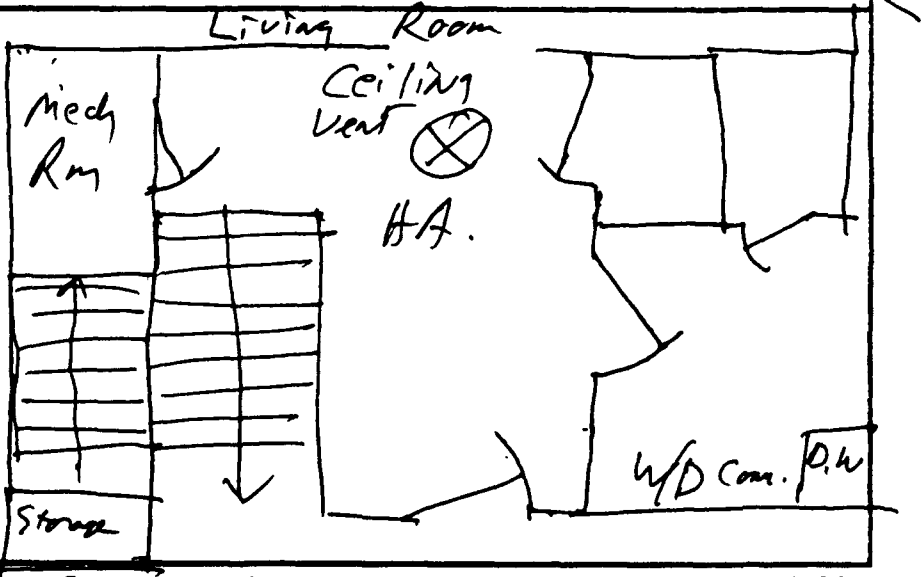
17 11.3 11.2

18 11.2 1600

ANALYTICAL DATA

NOTES SKETCHES REMARKS

TEM



AIR MONITORING DATA

CLIENT Argonne Nat'l Lab WORKER ORDER NUMBER 2104-13-02

PROJECT LOCATION Woodbridge VA Unit 14006

WORK AREA ID NO. SAMPLE NO. WB-06-BR

SAMPLE TYPE

PERSONNEL X AMBIENT

X Bedroom Vent (Wall)

SAMPLE DATA

0808 10:31 143

X

80 L. Nelms 27 Apr '98

21 11.2 11.3

22 11.4 1620

ANALYTICAL DATA

BCC (FA)

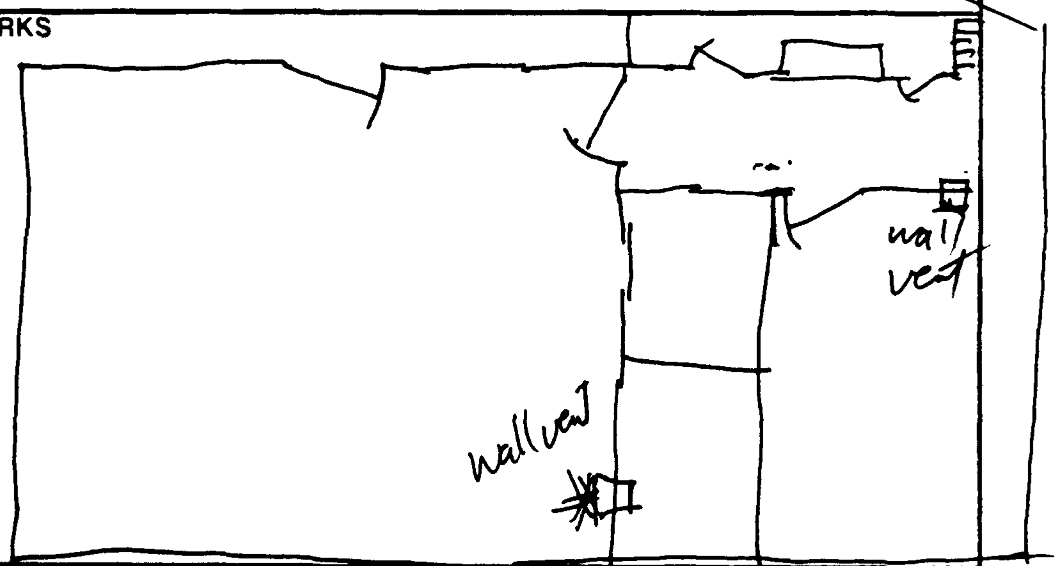
(A) MFA (1000)

... reported results were obtained when the sample was ... in accordance with NIOSH 7400

1
2
3
4
5
6
7
8
9
10

NOTES SKETCHES REMARKS

TEM



TAS-03 5-88
GEN TECH_ASB

Sheet ____ of ____

WESTON

AIR MONITORING DATA

CLIENT Argonne Nat'l Lab WORKER ORDER NUMBER 2104-13-02

PROJECT LOCATION Woodbridge, VA Unit 14006

WORK AREA ID NO. ______ SAMPLE NO. WB-06-BA

SAMPLE TYPE

X AMBIENT

X Bathroom Vent (wall at Floor)

DATA

0807 10:29 142

78 X L. Nelms 27 Apr '90

22 11.3 11.3

23 11.3 1600

ANALYTICAL DATA

... numbers ... fields

8

... were obtained when the sample was ... NIOSH 7400

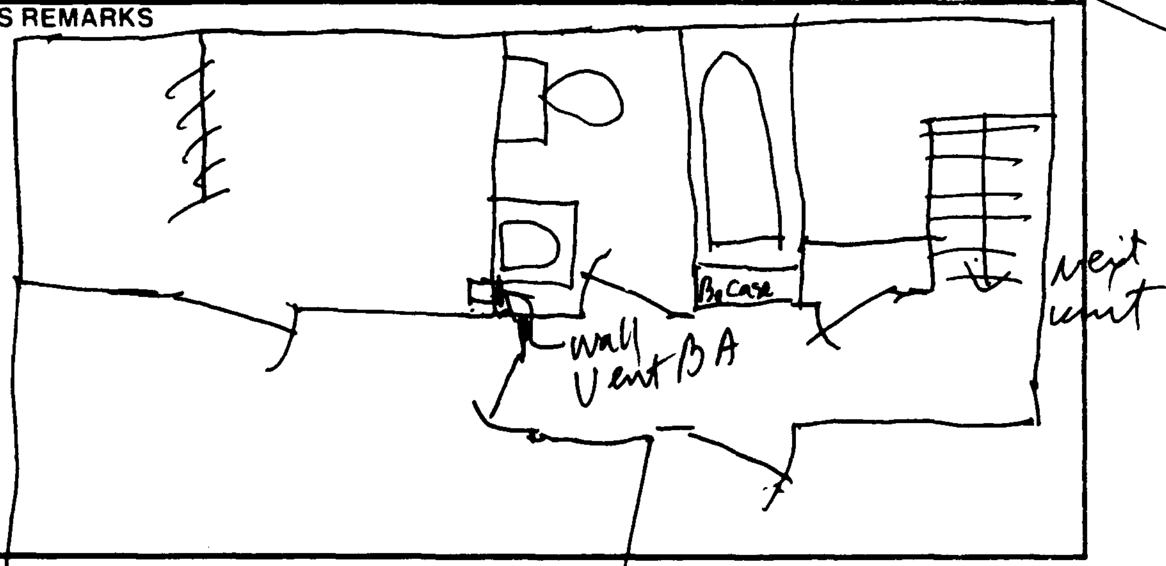
10

NOTES SKETCHES REMARKS

TEM

12X12 Tan tile w Br & Wht Streaks

Next Unit



TAS-03 5-88 Sheet ____ of ____ WESTON

GEN TECH ASB

AIR MONITORING DATA

CLIENT Argonne Nat'l Lab WORKER ORDER NUMBER 2404-13-02

PROJECT LOCATION Woodbridge VA Unit 14006

WORK AREA ID NO _____ SAMPLE NO WB-06-04T

SAMPLE TYPE

X

X

DATA

X

70

24 11.3 11.2

25 11.2 1610

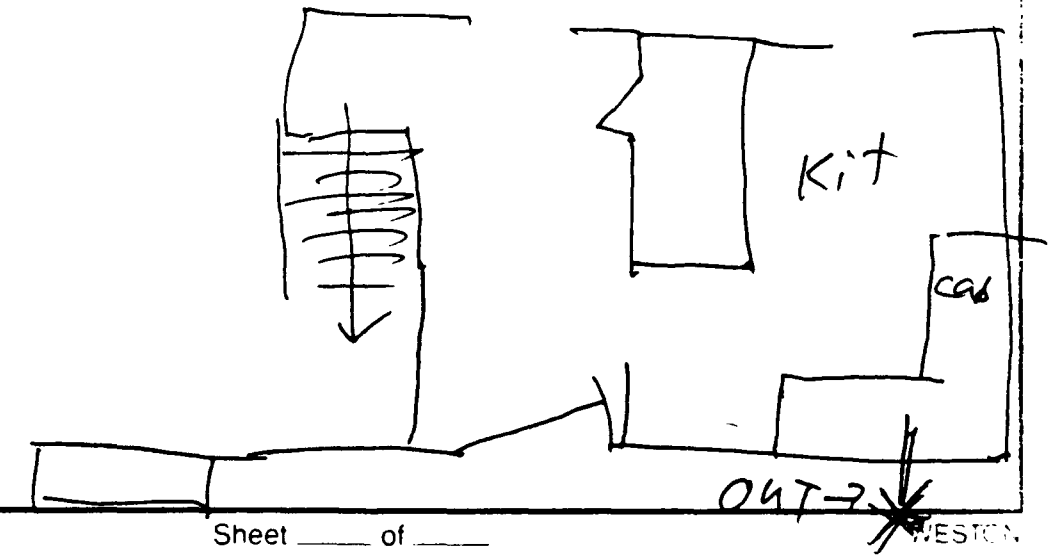
0809 1032 143

L Nelms 27 Apr '98

CAL DATA

NOTES SKETCHES REMARKS

TEM



TAS-03 5-88
GEN TECH ASB

Sheet _____ of _____

WESTON

AIR MONITORING DATA

CLIENT Argonne Nat'l Lab WORKER ORDER NUMBER 2104-13-02

PROJECT LOCATION Woodbridge VA Unit 14006

WORK AREA ID NO _____ SAMPLE # WB-06-FB

SAMPLE TYPE

X AMBIENT

X Field Blank

SAMPLE DATA

0809 1033 144

L. Nelms 27 Apr '90

None

N/A 0

N/A 0

ANALYTICAL DATA

Client's Name obtained when the sample was ... with NIOSH 7400

NOTES SKETCHES REMARKS

TEM

APPENDIX B.2. LABORATORY DATA, AIRBORNE ASBESTOS SAMPLING

ROY F. WESTON, INC.
1635 PUMPHREY AVE.
AUBURN, AL 36830
PHONE: (205) 826-6100
FAX: (205) 826-8232

TRANSMISSION ELECTRON MICROSCOPY ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: WB-06-LR

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EF004

Received by: Beth Hiltbold
Analyzed by: Beth Hiltbold

Date Received: 04/30/90
Date Analyzed: 05/02/90

Filter Type: 0.45 μm, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1600.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 6
Total Area Examined: 0.0528 mm²
Detection Limit: 0.00456 fibers/cc
Grid Archive No.: 0228-D-8,9

ANALYTICAL RESULTS

	Chrysotile		Amphiboles			
	<5μm	≥5μm	<5μm	≥5μm	Ambiguous	Non-Asbestos
Number of Fibers Analyzed:	0	0	0	0	0	3
Number of Bundles Analyzed:	0	0	0	0	0	2
Number of Clusters Analyzed:	0	0	0	0	0	1
Number of Matrices Analyzed:	0	0	0	0	0	1

SUMMARY

Concentration of Asbestos Structures < 5μm in length: ND (structures/cc)

Concentration of Asbestos Structures ≥ 5μm in length: ND (structures/cc)

Concentration of Asbestos Structures < 5μm in length: ND (structures/mm²)

Concentration of Asbestos Structures ≥ 5μm in length: ND (structures/mm²)

Total Concentration of Asbestos Structures ND (structures/cc)

Total Concentration of Asbestos Structures ND (structures/mm²)

Comments.

Barry Ranfield
(Approved for Transmittal)

May 2, 1990
(Date)

This test report relates only to the specific items tested.

ROY F. WESTON, INC.
1635 PUMPHREY AVE.
AUBURN, AL 36830
PHONE: (205) 826-6100
FAX: (205) 826-8232

TRANSMISSION ELECTRON MICROSCOPY ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: WB-06-HA

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EF005

Received by: Beth Hiltbold
Analyzed by: Beth Hiltbold

Date Received: 04/30/90
Date Analyzed: 05/02/90

Filter Type: 0.45 μm, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1600.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 6
Total Area Examined: 0.0528 mm²
Detection Limit: 0.00456 fibers/cc
Grid Archive No.: 0228-E-6,7

ANALYTICAL RESULTS

	Chrysotile		Amphiboles			
	<5μm	≥5μm	<5μm	≥5μm	Ambiguous	Non-Asbestos
Number of Fibers Analyzed:	0	0	0	0	0	0
Number of Bundles Analyzed:	0	1	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	1

SUMMARY

Concentration of Asbestos Structures < 5μm in length: ND (structures/cc)

Concentration of Asbestos Structures ≥ 5μm in length: 0.005 (structures/cc)

Concentration of Asbestos Structures < 5μm in length: ND (structures/mm²)

Concentration of Asbestos Structures ≥ 5μm in length: 18.94 (structures/mm²)

Total Concentration of Asbestos Structures 0.005 (structures/cc)

Total Concentration of Asbestos Structures 18.94 (structures/mm²)

Comments: An energy dispersive spectrum (EF005.eds), a diffraction pattern (B807), and a micrograph (B808) were recorded.

Barry Ray Field
(Approved for Transmittal)

May 2, 1990
(Date)

This test report relates only to the specific items tested.

ROY F. WESTON, INC.
1635 PUMPHREY AVE.
AUBURN, AL 36830
PHONE: (205) 826-6100
FAX: (205) 826-8232

TRANSMISSION ELECTRON MICROSCOPY ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: WB-06-BR

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EF006

Received by: Beth Hiltbold
Analyzed by: Greg Hall

Date Received: 04/30/90
Date Analyzed: 05/02/90

Filter Type: 0.45 μm, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1620.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 6
Total Area Examined: 0.0528 mm²
Detection Limit: 0.00450 fibers/cc
Grid Archive No.: 0229-A-1,2

ANALYTICAL RESULTS

	Chrysotile		Amphiboles			
	<5μm	≥5μm	<5μm	≥5μm	Ambiguous	Non-Asbestos
Number of Fibers Analyzed:	0	0	0	0	0	1
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	1
Number of Matrices Analyzed:	0	0	0	0	0	2

SUMMARY

Concentration of Asbestos Structures < 5μm in length: ND (structures/cc)

Concentration of Asbestos Structures ≥ 5μm in length: ND (structures/cc)

Concentration of Asbestos Structures < 5μm in length: ND (structures/mm²)

Concentration of Asbestos Structures ≥ 5μm in length: ND (structures/mm²)

Total Concentration of Asbestos Structures ND (structures/cc)

Total Concentration of Asbestos Structures ND (structures/mm²)

Comments:

Barry Layfield
(Approved for Transmittal)

May 2, 1990
(Date)

This test report relates only to the specific items tested.

ROY F. WESTON, INC.
1635 PUMPHREY AVE.
AUBURN, AL 36830
PHONE: (205) 826-6100
FAX: (205) 826-8232

TRANSMISSION ELECTRON MICROSCOPY ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: WB-06-BA

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EF007

Received by: Beth Hiltbold
Analyzed by: Greg Hall

Date Received: 04/30/90
Date Analyzed: 05/02/90

Filter Type: 0.45 μm, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1600.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 6
Total Area Examined: 0.0528 mm²
Detection Limit: 0.00456 fibers/cc
Grid Archive No.: 0229-A-4,5

ANALYTICAL RESULTS

	Chrysotile		Amphiboles			
	<5μm	≥5μm	<5μm	≥5μm	Ambiguous	Non-Asbestos
Number of Fibers Analyzed:	0	0	0	0	0	0
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	1

SUMMARY

Concentration of Asbestos Structures < 5μm in length: ND (structures/cc)

Concentration of Asbestos Structures ≥ 5μm in length: ND (structures/cc)

Concentration of Asbestos Structures < 5μm in length: ND (structures/mm²)

Concentration of Asbestos Structures ≥ 5μm in length: ND (structures/mm²)

Total Concentration of Asbestos Structures ND (structures/cc)

Total Concentration of Asbestos Structures ND (structures/mm²)

Comments:

Barry Rayfield
(Approved for Transmittal)

May 2, 1990
(Date)

This test report relates only to the specific items tested.

ROY F. WESTON, INC.
1635 PUMPHREY AVE.
AUBURN, AL 36830
PHONE: (205) 826-6100
FAX: (205) 826-8232

TRANSMISSION ELECTRON MICROSCOPY ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: WB-06-OUT

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: FF008

Received by: Beth Hiltbold
Analyzed by: Greg Hall

Date Received: 04/30/90
Date Analyzed: 05/03/90

Filter Type: 0.45 μm, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1610.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 6
Total Area Examined: 0.0528 mm²
Detection Limit: 0.00453 fibers/cc
Grid Archive No.: 0229-D-9,10

ANALYTICAL RESULTS

	Chrysotile		Amphiboles			
	<5μm	≥5μm	<5μm	≥5μm	Ambiguous	Non-Asbestos
Number of Fibers Analyzed:	0	0	0	0	0	8
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	0

SUMMARY

Concentration of Asbestos Structures < 5μm in length: ND (structures/cc)

Concentration of Asbestos Structures ≥ 5μm in length: ND (structures/cc)

Concentration of Asbestos Structures < 5μm in length: ND (structures/mm²)

Concentration of Asbestos Structures ≥ 5μm in length: ND (structures/mm²)

Total Concentration of Asbestos Structures ND (structures/cc)

Total Concentration of Asbestos Structures ND (structures/mm²)

Comments:

Barry Rayfield
(Approved for Transmittal)

May 3, 1990
(Date)

This test report relates only to the specific items tested.

ROY F. WESTON, INC.
1635 PUMPHREY AVE.
AUBURN, AL 36830
PHONE: (205) 826-6100
FAX: (205) 826-8232

TRANSMISSION ELECTRON MICROSCOPY ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: WB-06-FB

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EF009

Received by: Beth Hiltbold
Analyzed by: Barry Rayfield

Date Received: 04/30/90
Date Analyzed: 05/03/90

Filter Type: 0.45 μm, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 0.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 10
Total Area Examined: 0.0880 mm²
Detection Limit: BLANK SAMPLE
Grid Archive No.: 0229-E-7,8

ANALYTICAL RESULTS

	Chrysotile		Amphiboles			
	<5μm	≥5μm	<5μm	≥5μm	Ambiguous	Non-Asbestos
Number of Fibers Analyzed:	0	0	0	0	0	0
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	0

SUMMARY

Concentration of Asbestos Structures < 5μm in length: BLANK (structures/cc)

Concentration of Asbestos Structures ≥ 5μm in length: BLANK (structures/cc)

Concentration of Asbestos Structures < 5μm in length: BLANK (structures/mm²)

Concentration of Asbestos Structures ≥ 5μm in length: BLANK (structures/mm²)

Total Concentration of Asbestos Structures BLANK (structures/cc)

Total Concentration of Asbestos Structures BLANK (structures/mm²)

Comments:

Barry Rayfield
(Approved for Transmittal)

May 3, 1990
(Date)

This test report relates only to the specific items tested.